

GODDARD SPACE FLIGHT CENTER

Test Lab Report Summary

<i>Report Number:</i>	Q10166DPA	<i>Project:</i>	SWIFT
<i>Part Type:</i>	Microcircuit	<i>System:</i>	BAT
<i>Part Number:</i>	OP293ES	<i>Initiated Date:</i>	05/01/2001
<i>Date Code:</i>	0019	<i>Report Date:</i>	07/10/2001
<i>Manufacturer:</i>	Analog Devices	<i>Investigator:</i>	C. Greenwell (562)
<i>Generic Number:</i>	OP293	<i>Requester:</i>	B. Meinhold (562)
<i>Purchase Spec:</i>	Commercial	<i>Approval / Date:</i>	

Step 1: INCOMING INSPECTION

<u>Test</u>	<u>Quantity</u>	<u>Passed</u>	<u>Failed</u>
External Visual	N/A	N/A	N/A
PIND Condition A	N/A	N/A	N/A

Step 2: DESTRUCTIVE PHYSICAL ANALYSIS

Destructive Physical Analysis (DPA) was conducted per GSFC document "Plastic Encapsulated Microcircuit (PEM) Guidelines for Screening and Qualification for Space Applications", except that cross-section was done without dye penetrant and glassivation integrity testing was not performed.

No rejectable defects or anomalies were observed during this analysis.

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Summary of Analysis:

	<i>Serial Number</i>	<u>A20</u>	<u>U2</u>	<u>U4</u>	<u>V2</u>	<u>V4</u>
<i>External Examination</i>						
1. Markings - legibility and correctness _____		A	A	A	A	A
2. Integrity of package seals _____		N/A	N/A	N/A	N/A	N/A
3. Condition of external leads and plating _____		A	A	A	A	A
4. Overall package condition _____		A	A	A	A	A
<i>Radiographic Examination</i>						
5. Die bonding material and die alignment _____		A	A	A	A	A
6. Package seal integrity _____		N/A	N/A	N/A	N/A	N/A
7. Presence of foreign material _____		A	A	A	A	A
8. Lead dress (if revealed) _____		A	A	A	A	A
<i>Acoustic Microscopy Inspection</i>						
9. Condition of material interfaces (delaminations) _____		A	A	A	A	A
10. Condition of molding material (voids, cracks) _____		A	A	A	A	A
<i>Internal Examination (including cross-section)</i>						
11. Presence of foreign material _____		A	A	A	A	A
12. Mechanical condition of die _____		A	A	A	A	A
13. Wire bonds and lead dress _____		A	A	A	N/P	N/P
14. Die bonding material _____		A	A	A	A	A
15. Condition of die surface _____		A	A	A	N/P	N/P
16. Condition of metallization _____		A	A	A	N/P	N/P
17. SEM Examination _____		A	A	A	N/P	N/P
<i>Bond Strength</i>						
18. Strength _____		A	A	A	N/P	N/P
19. Metallization adherence _____		A	A	A	N/P	N/P
<i>Die Bond Strength</i>						
20. Strength _____		N/P	N/P	N/P	N/P	N/P

SN's V2 and V4 subjected to cross-sectional examination.

(* = Refer to comments, A = acceptable, U = unacceptable, N/A = not applicable, N/P = not performed)

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Appended Photographs:

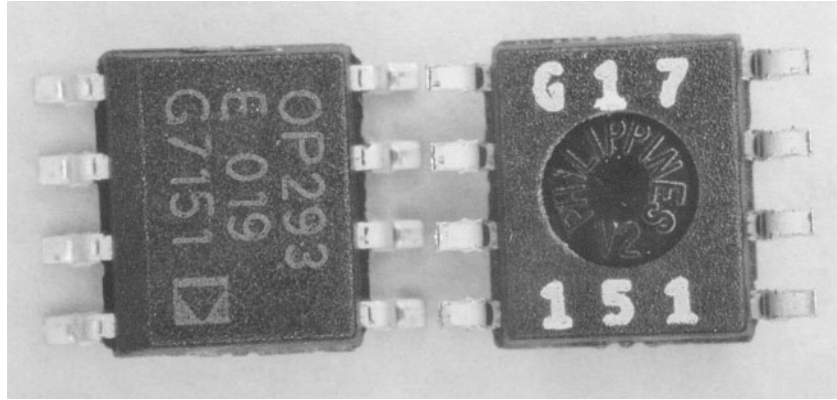


Figure 1. External top and bottom views of the OP293ES devices. Each device had a unique two or three character alphanumeric code that was used for reference designations during this analysis. 6X

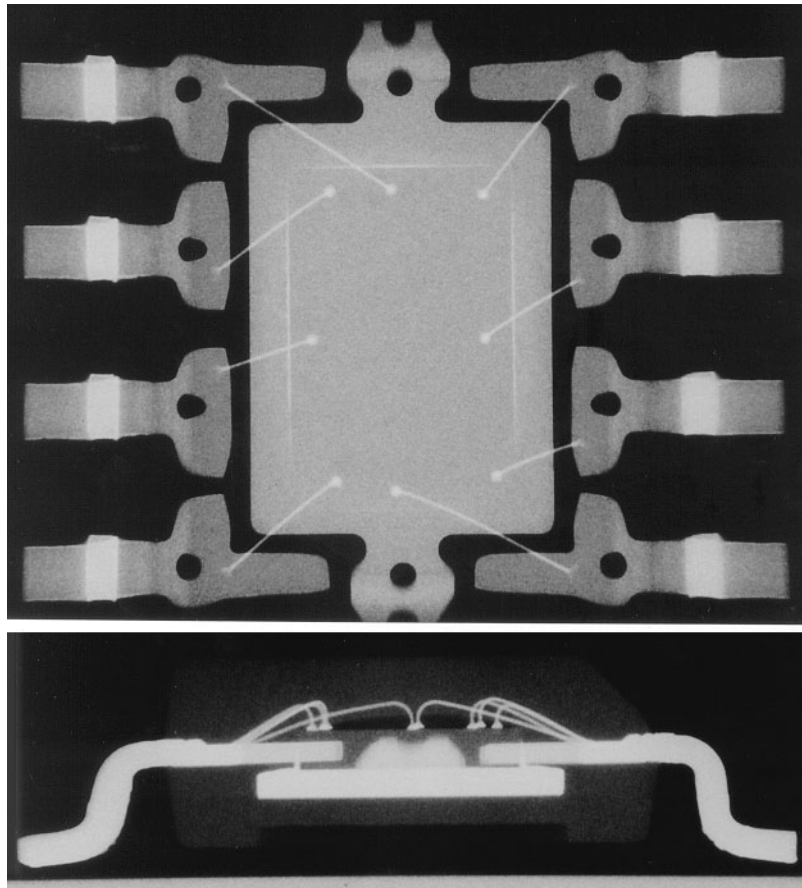


Figure 2. Top and side view radiographic images. 16X

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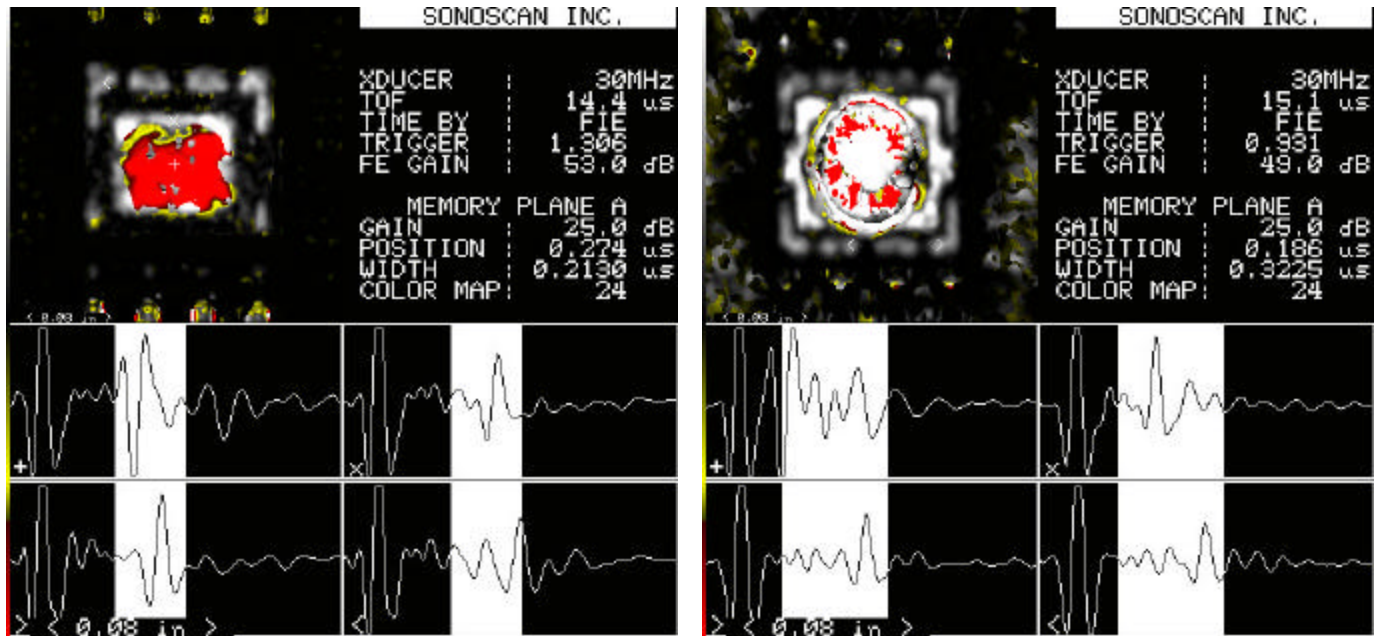


Figure 3. Top (left) and bottom C-SAM images of SN A20. The red area in the topside view is produced by the glob-top coating on the die. Red areas in the bottom view are due to the embossed lettering in the molded package.

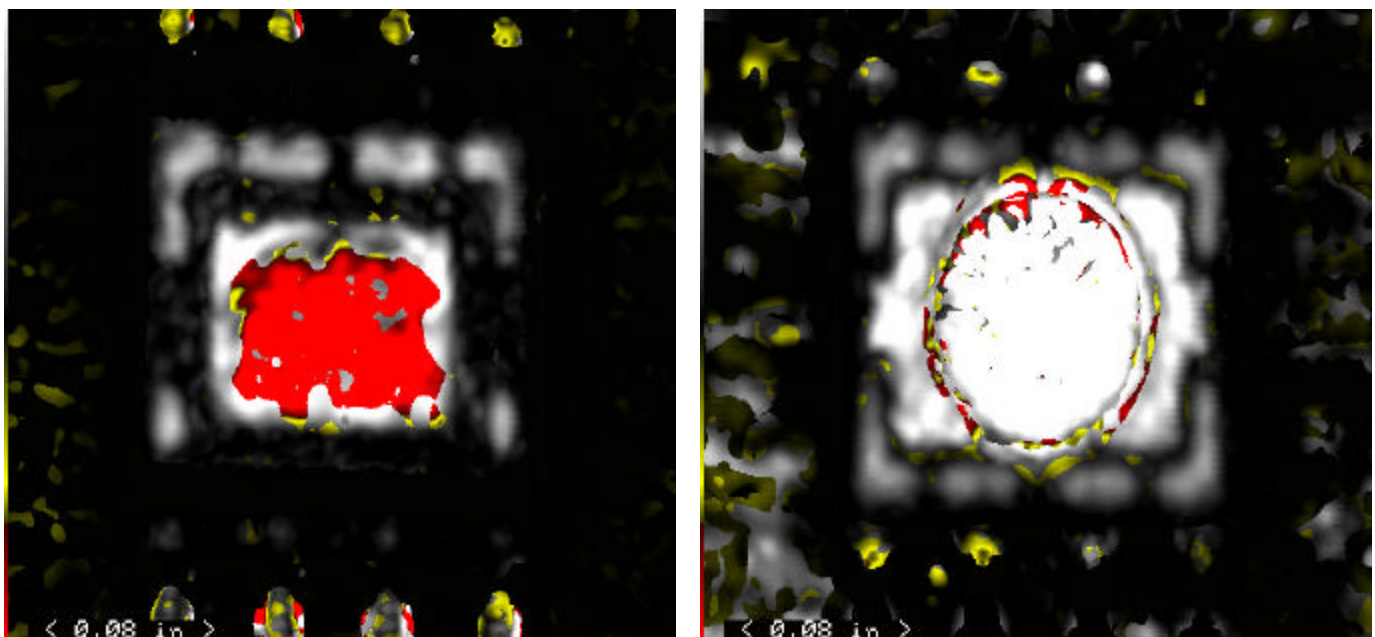


Figure 4. Top (left) and bottom C-SAM images of SN U2.

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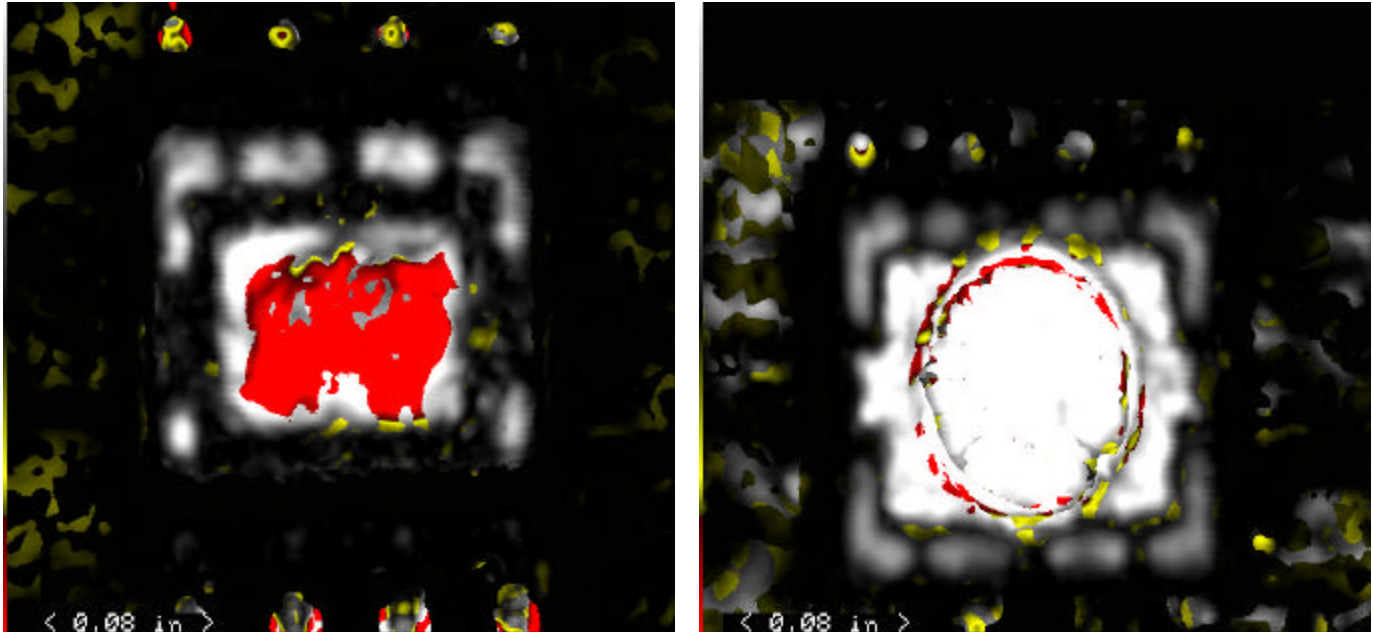


Figure 5. Top (left) and bottom C-SAM images of SN U4.

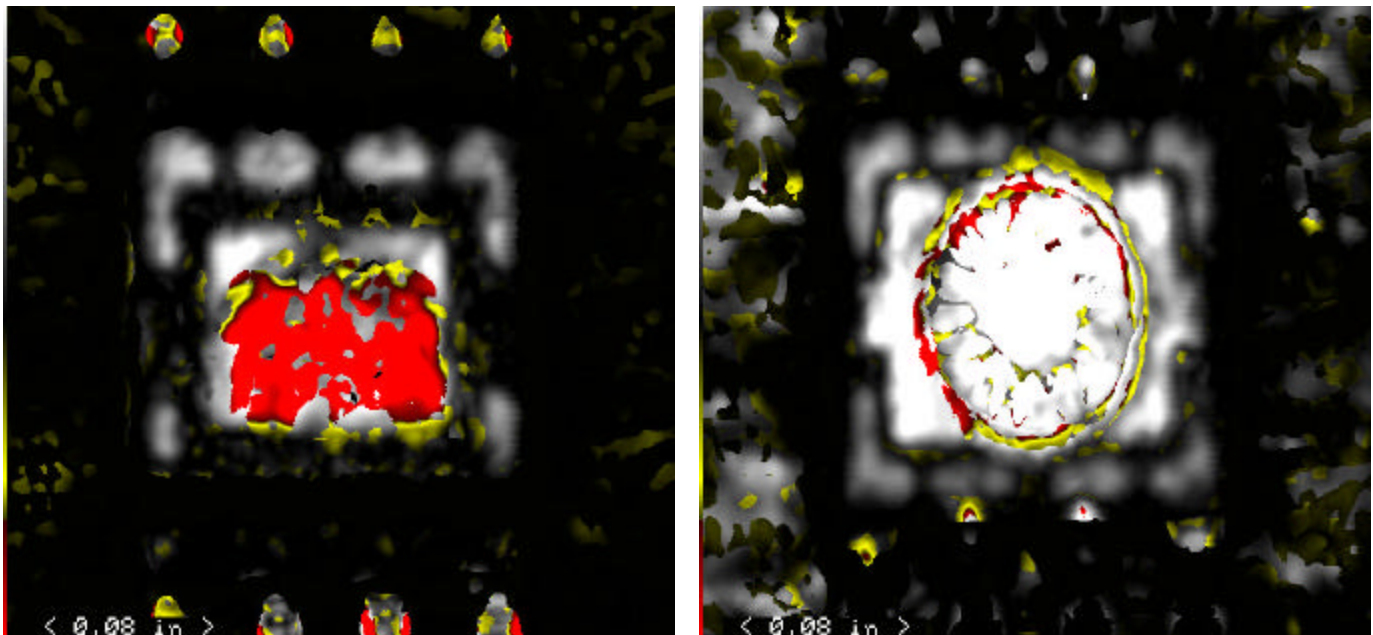


Figure 6. Top (left) and bottom C-SAM images of SN V2.

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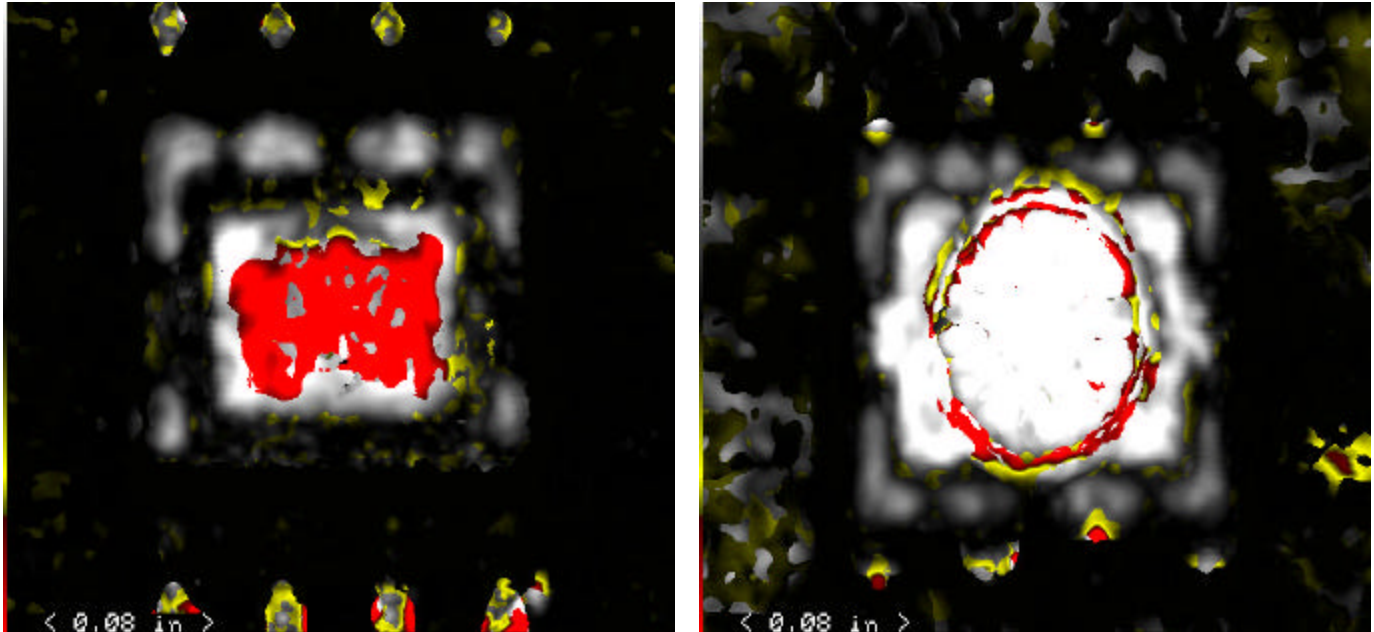
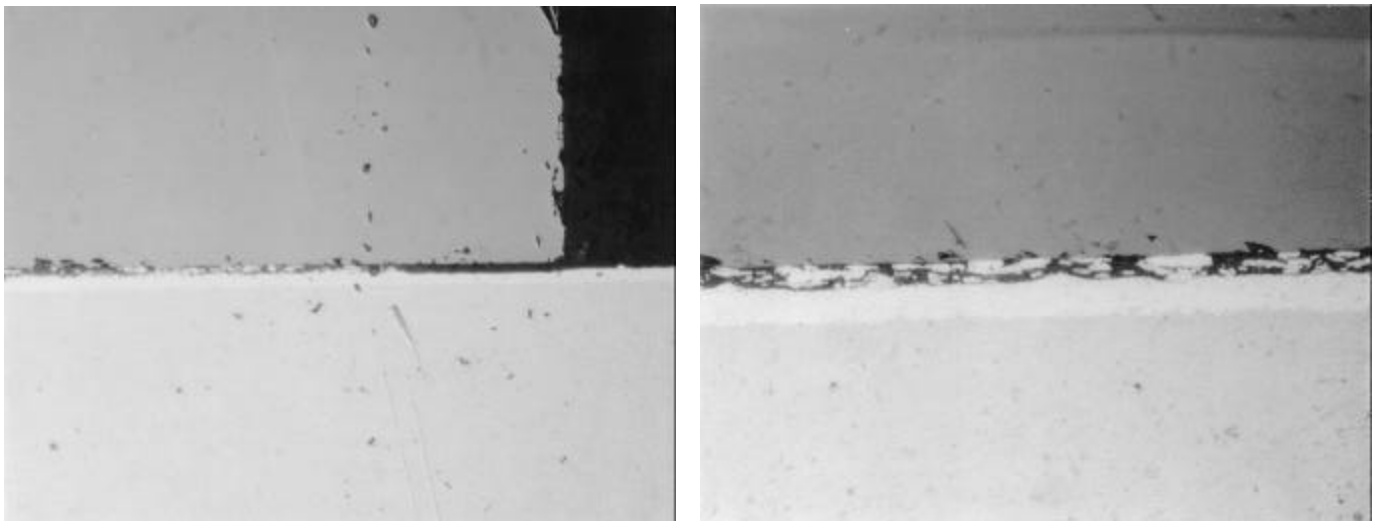


Figure 7. Top (left) and bottom C-SAM images of SN V4.

Figure 8. Cross-section images of SN V2 showing die attach interface. Left image $\approx 400\times$; right $\approx 1000\times$.

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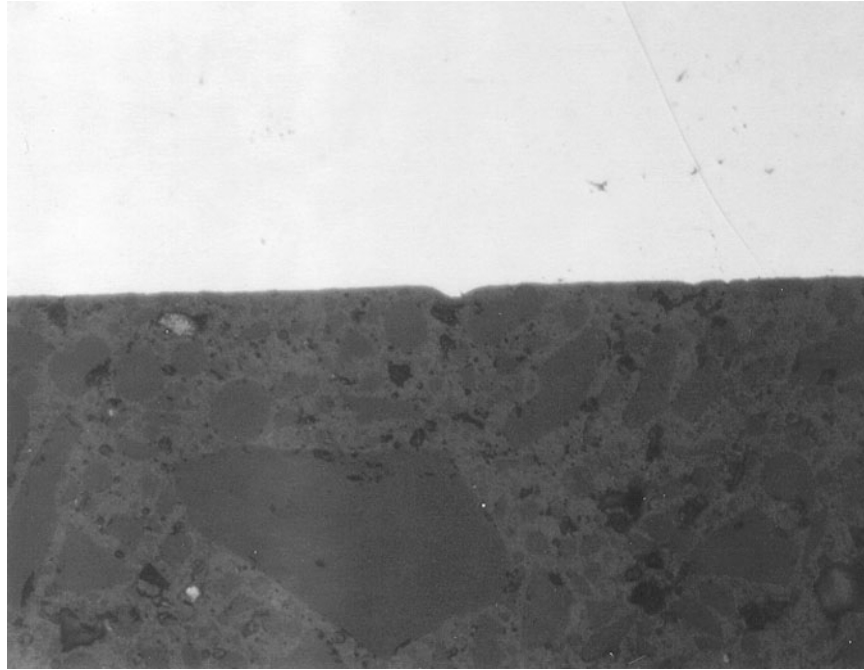


Figure 9. Cross-section images of SN V4 show interface between the bottom side of the die paddle and the plastic molding material. No delamination or anomalies were observed. $\approx 400\times$.

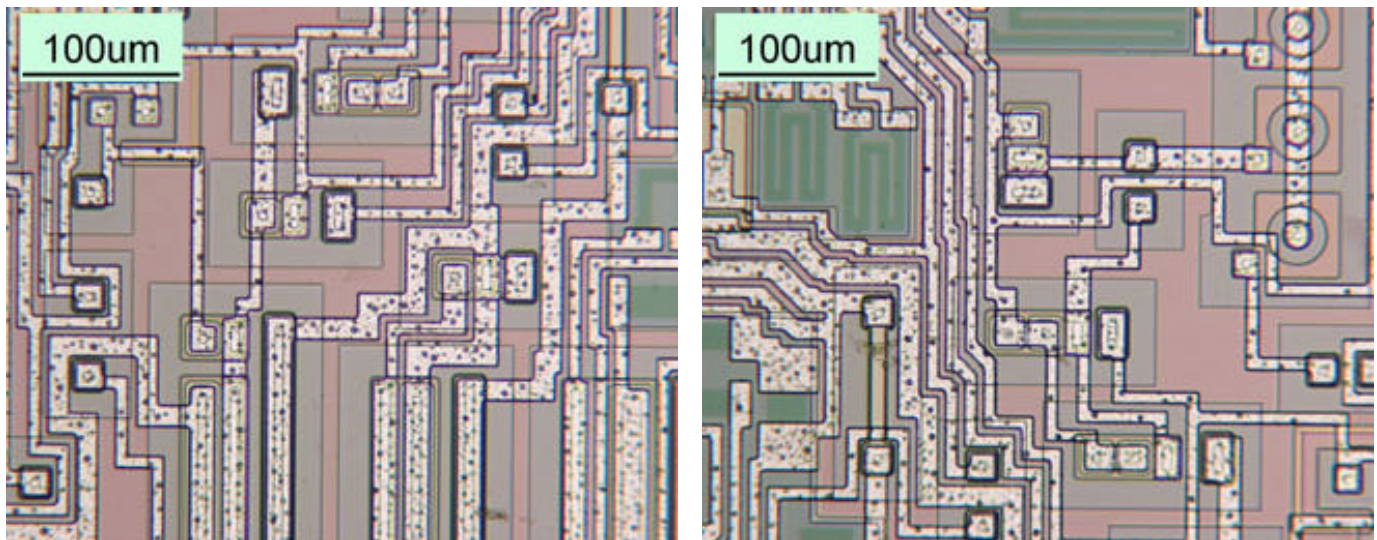


Figure 10. Optical micrograph images of SN A20 die show general device features.

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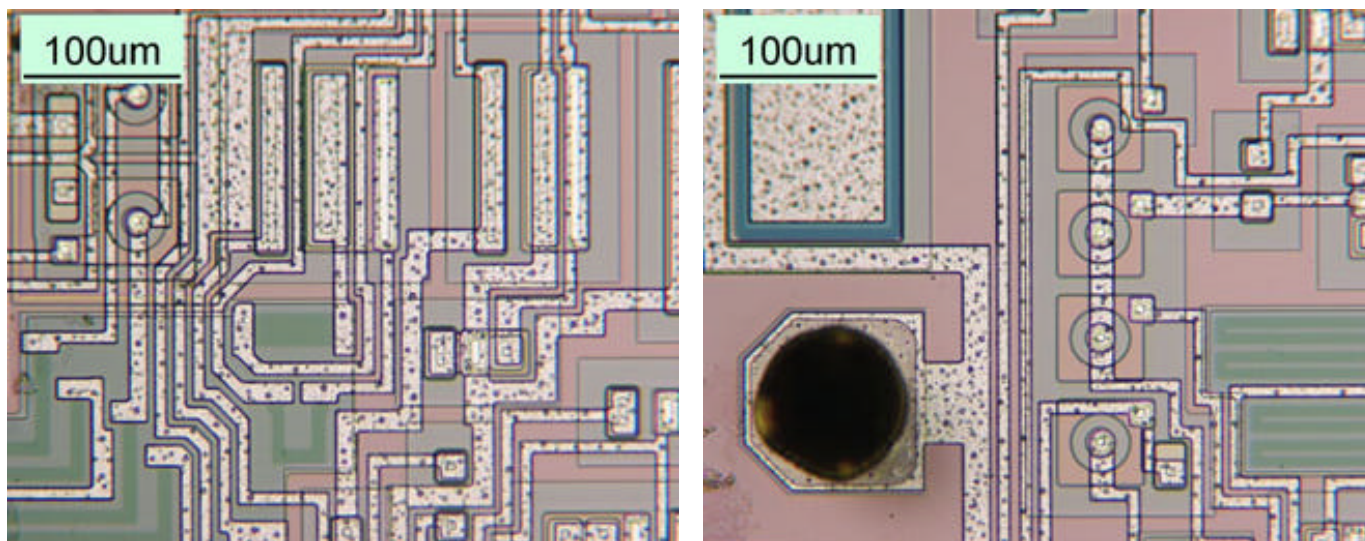


Figure 11. Optical micrograph images of SN U2 die.

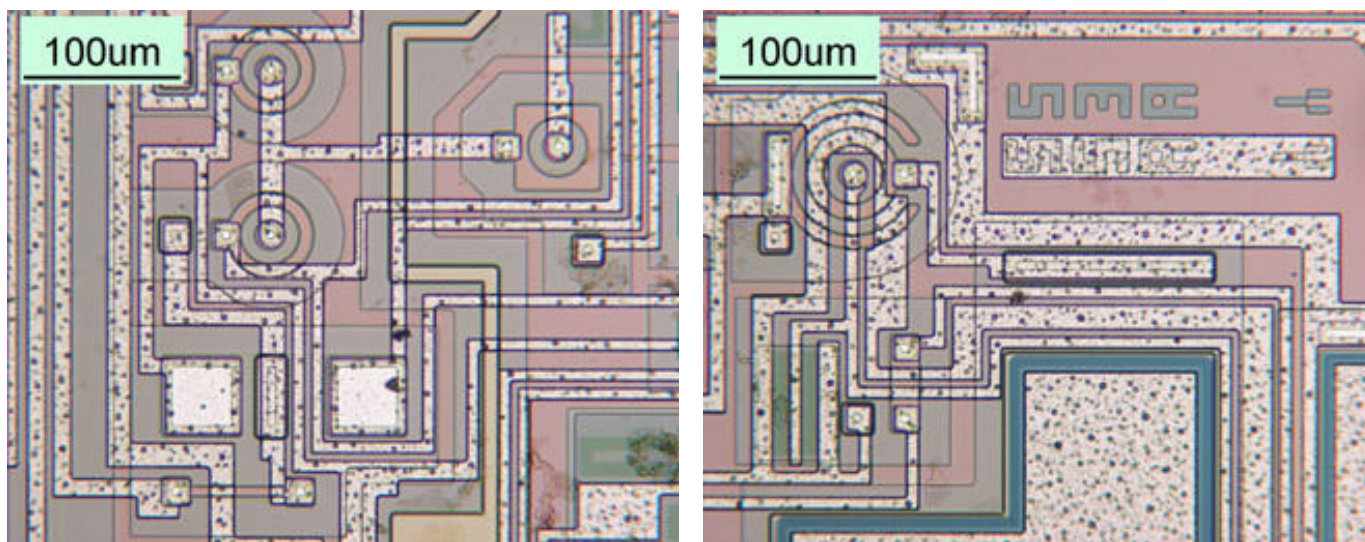


Figure 12. Optical micrograph images of SN U4 die.

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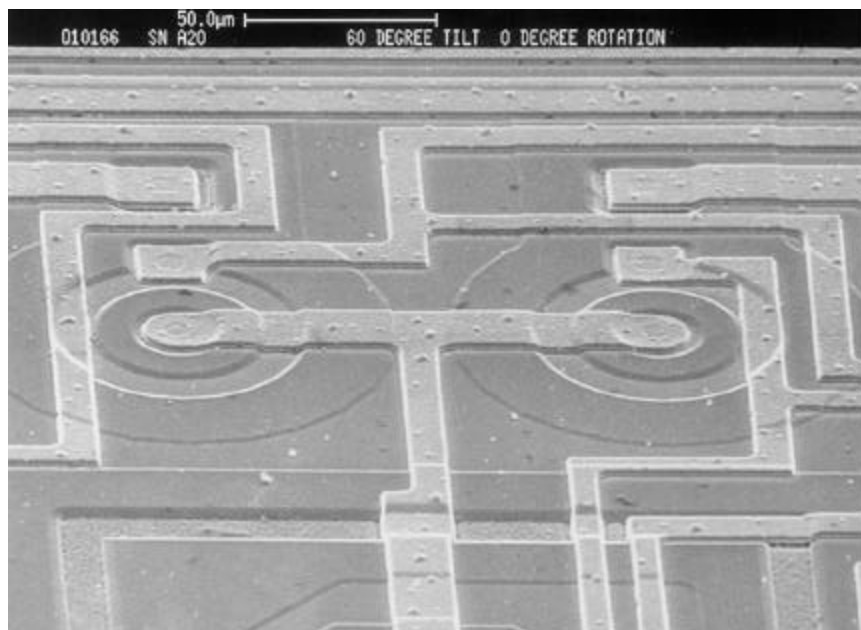


Figure 13. SEM micrograph shows general metallization on SN A20.

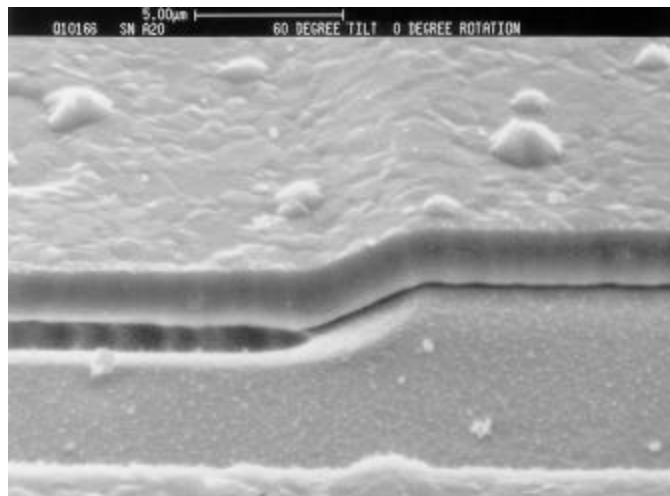
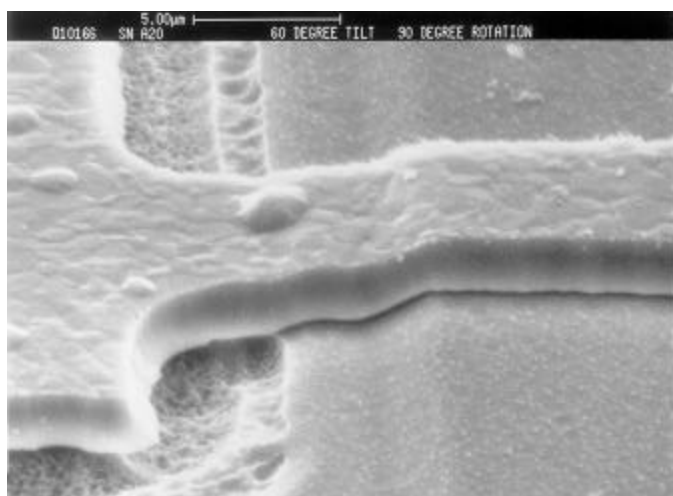


Figure 14. SEM micrographs of SN A20 show excellent step coverage.

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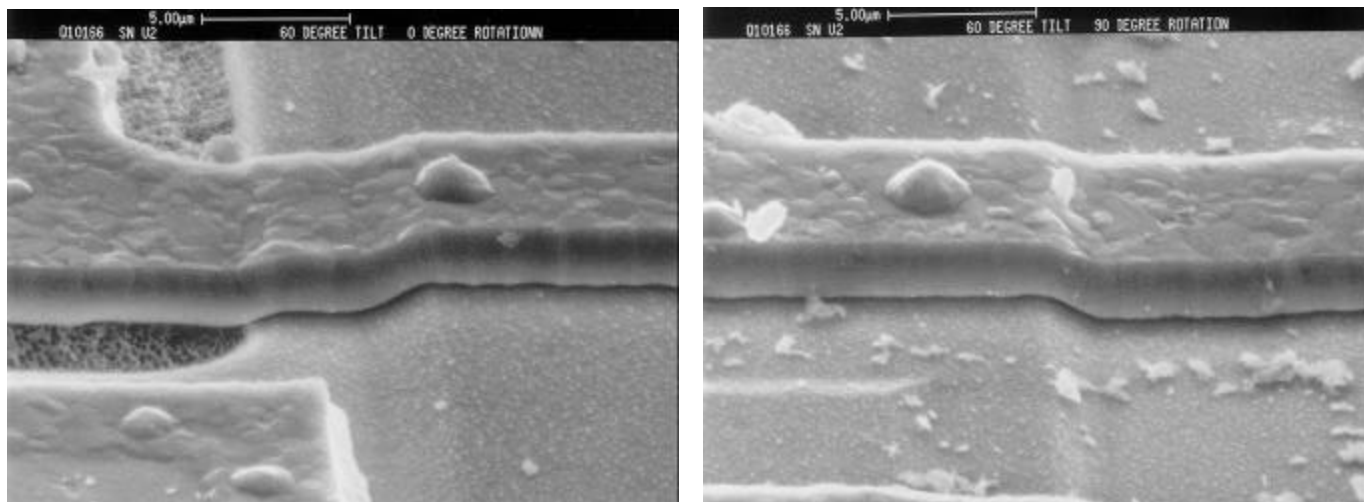


Figure 15. SEM micrographs of SN U2.

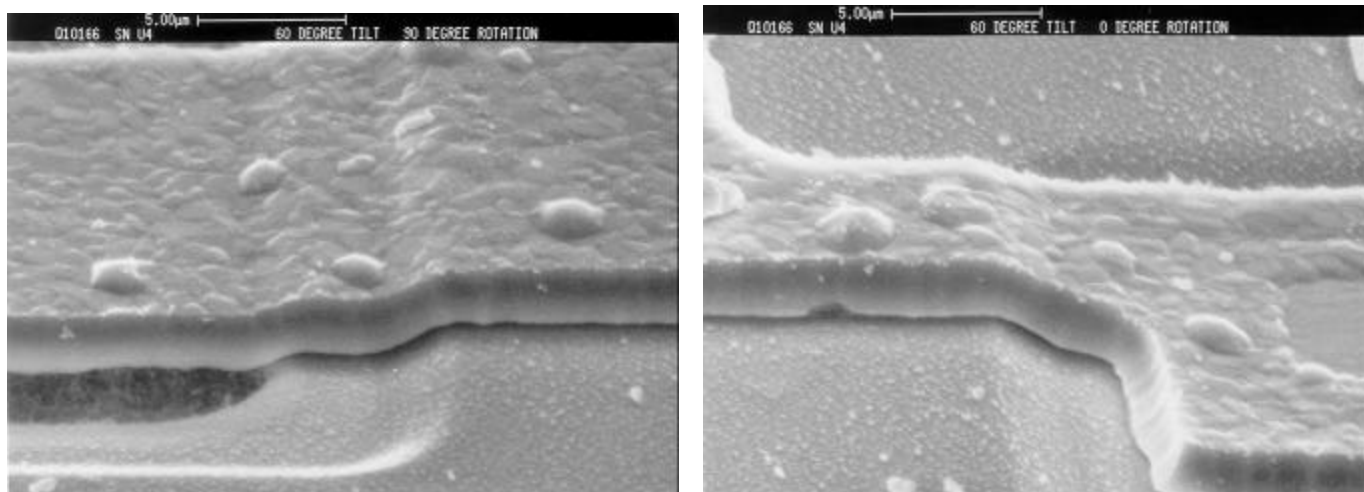


Figure 16. SEM micrographs of SN U4.